EXOMARS

V. Giorgio

Exploration and Science

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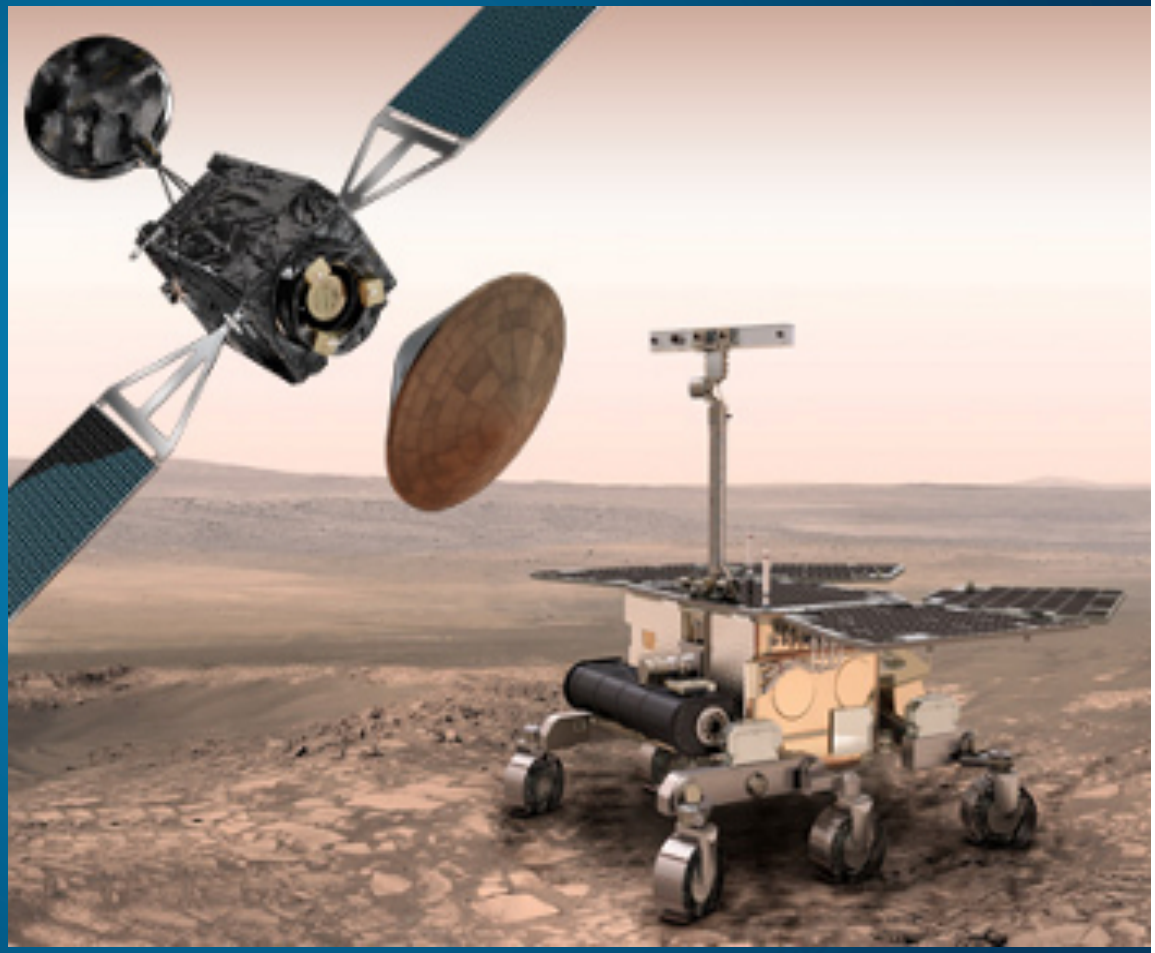
83230913-DOC-TAS-EN-001

EXOMARS

- Two missions are foreseen within the ExoMars programme:
  - 2016: Orbiter plus an Entry, Descent and Landing Demonstrator Module
  - 2018: Rover
- Both missions carried out in cooperation with Roscosmos

- The ExoMars programme will demonstrate a number of essential flight and in-situ **enabling technologies necessary for future exploration missions, such as an international Mars Sample Return mission**
- At the same time a number of important scientific investigations will be carried out, as the search for **signs of past and present life on Mars**



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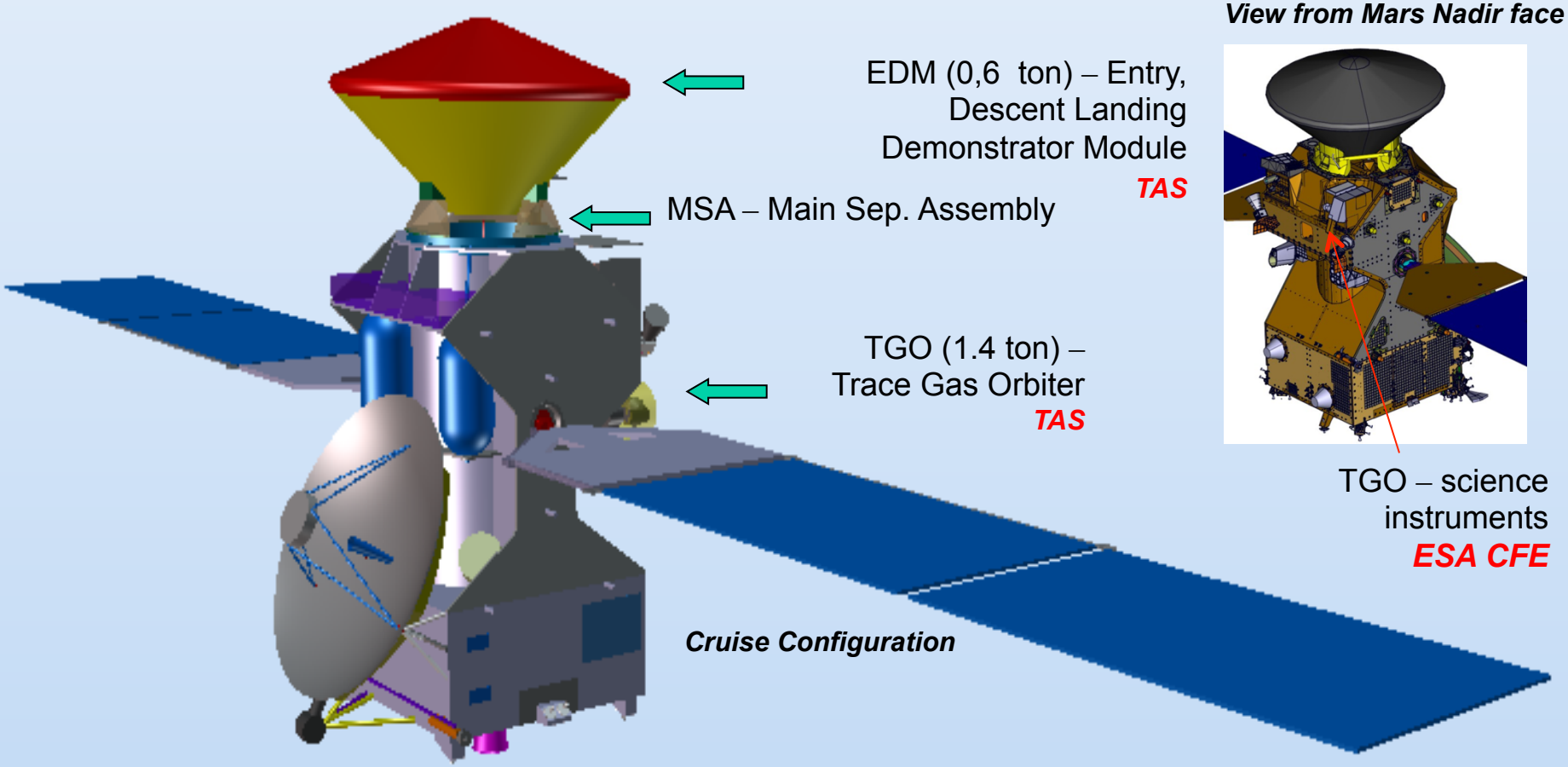
2016 Mission

2016 Mission Objectives

- **Technological Objectives**
  - To demonstrate European ability to land a surface package on Mars
  - **Entry, Descent and Landing Demonstrator Module (EDM)**
    - **DM Release: From hyperbolic trajectory, Oct 2016**
    - **Landing Accuracy : 50 km 3σ, ellipse major axis dispersion**
- **Scientific Objectives**
  - Characterise Martian atmosphere gases
    - **Trace Gas Orbiter (TGO) and its 4-Experiments package**
- **Data Relay**
  - Provide communications link to ground for 2018 EXOMARS mission and other future Martian missions
    - **UHF package inside TGO**

2016 mission - Spacecraft Composite



View from Mars Nadir face

TGO – science instruments
ESA CFE

TAS-I Torino: Overall Prime Contractor

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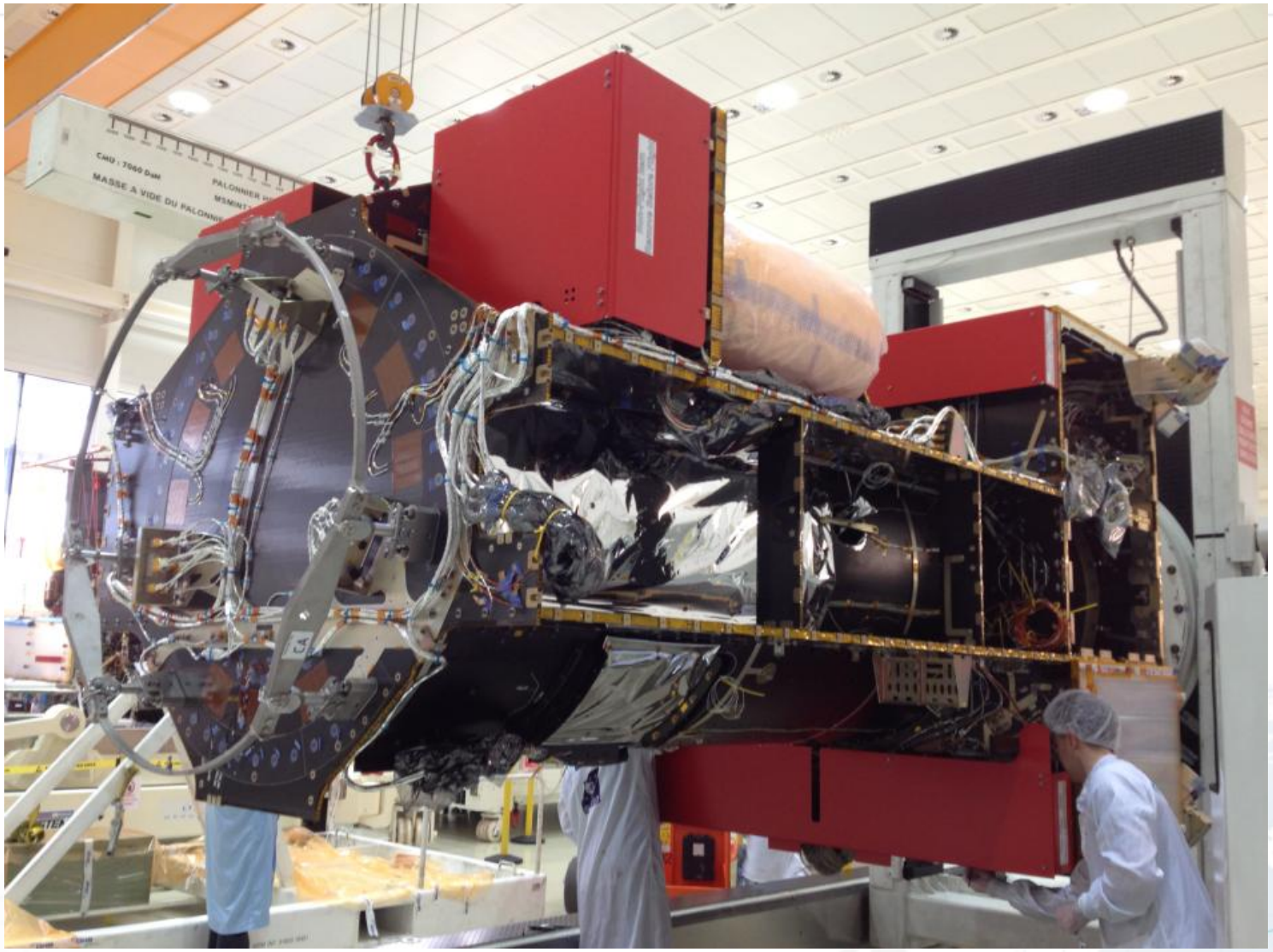

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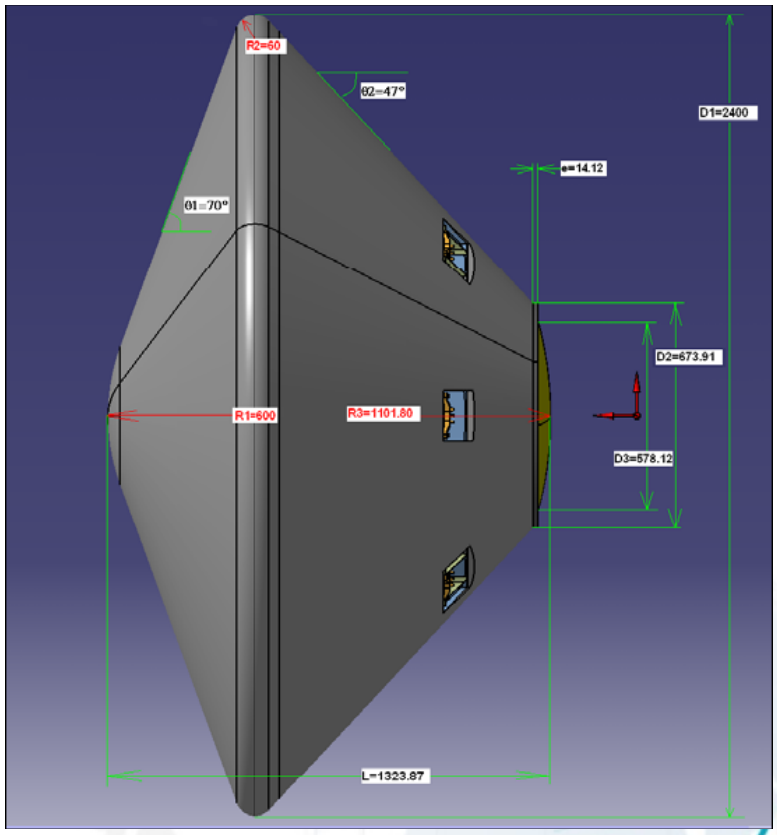
2016 EDL Demonstrator Module (EDM)

- Blunt-shaped vehicle:
  - 70° sphere-cone Front Shield
  - 47° conical Back Shield
  - Break-Out Patch
- EDM Outer diameter: 2.4 m
- EDM Height: 1.3 m
- EDM Mass: 600 kg
- EDM CoG distance from nose <27% diameter



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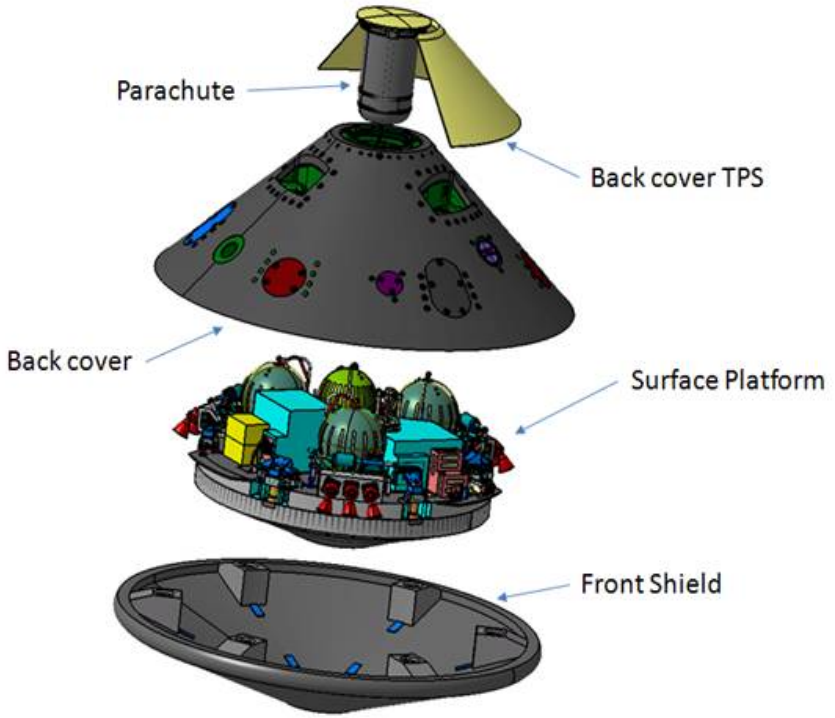
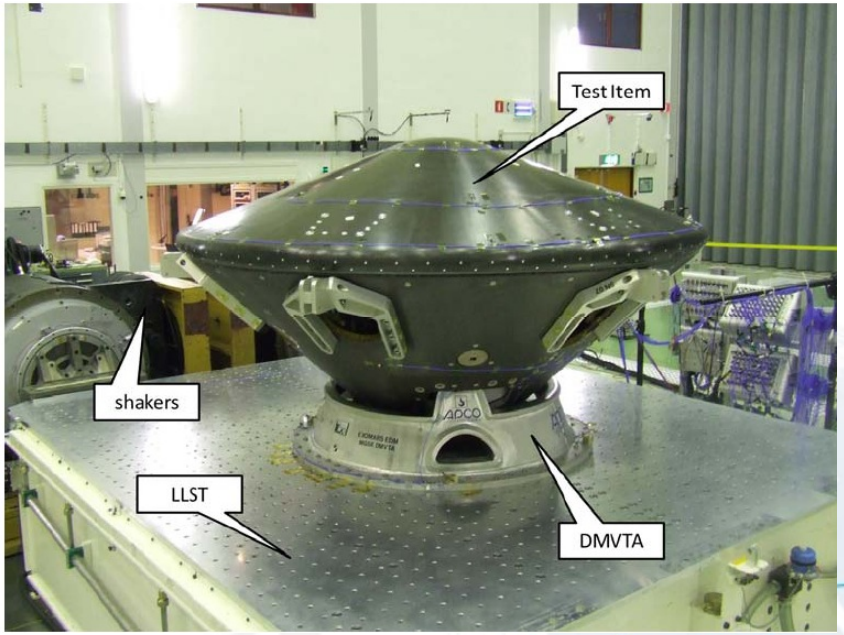
Demonstrate European entry, descent and landing technologies for future missions to Mars

- **Parachute** deployment (Mach 1.95)
- **Front Shield** jettison ➔ **RDA** operational
- **Back Cover** separation (1400 m, 80 m/s) ➔ **RCS** activation 1 s later
- **Attitude controlled** final braking with RCS (up to <2 m)
- Landing on **crushable structure** at Meridiani Planum



Status

- **DHMR Test performed in the TAS-I Turin Autoclavet ~125 ºC in dry nitrogen environment**
- **Sine Test Performed in ESTEC Test Facility**
- **Biosealing/Heatsealing verification performed before and after the above tests**



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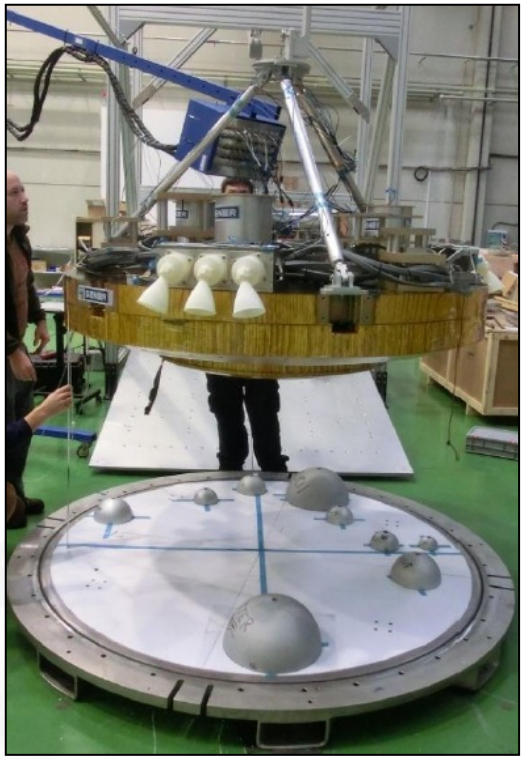
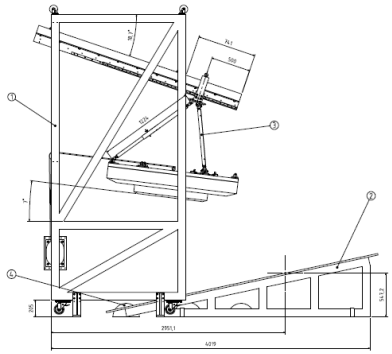
- Landing Impact tests
  - Crushing Test on Samples (performed)
  - Full Scale BB crush test campaign (performed)
  - Qualification Test on ESP QM
  - Test performed at subcontractor level (SENER)





- Test on full scale BB

Credit of SENER

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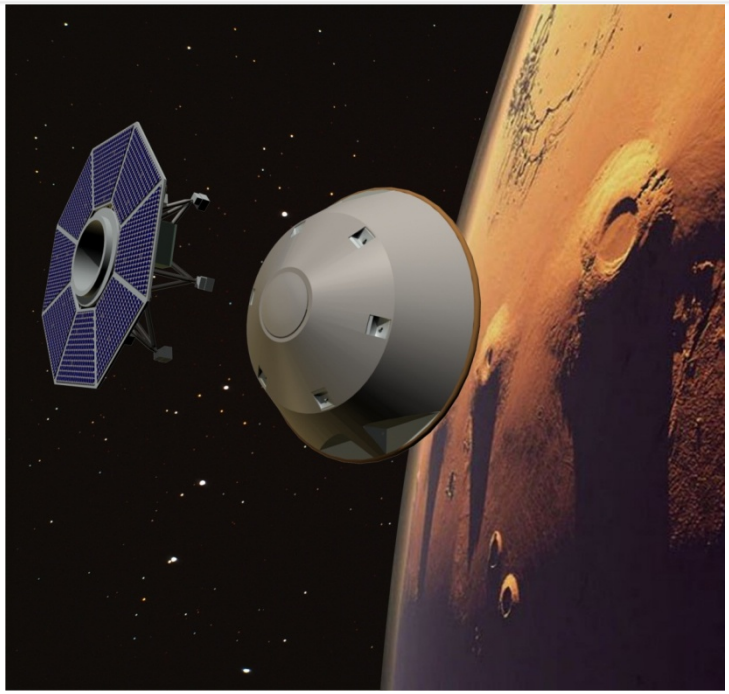
2018 Mission



2018 Mission Objectives

- **Technological Objectives**
  - Access to the sub-surface to acquire samples
  - Sample acquisition, preparation, distribution, and analysis
    - **Rover, Drill, ALD**
- **Scientific Objectives**
  - Search for signs of past and present life on Mars
  - Investigate the water/geochemical environment as a function of depth in the shallow subsurface (2018); Investigate Martian atmospheric trace gases and their sources (2016 and 2018)
    - **Rover, Drill, TGO**

2018 Mission Overview

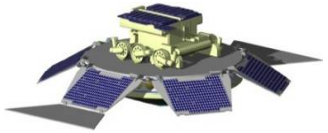
Launch: May 2018

Arrival: Jan 2019

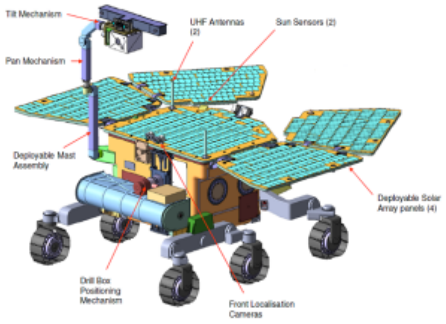
Spacecraft Composite (Carrier Module + Descent Module + Rover Module)

Proton M/Breeze M

Rover and Landing Platform



Rover



ESA ESTRACK

Roscosmos DSN

NASA DSN (in contingency cases)

ROCC (incl. SOC- Altec)

Lander Op. Center (ROS)

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20 January 2012

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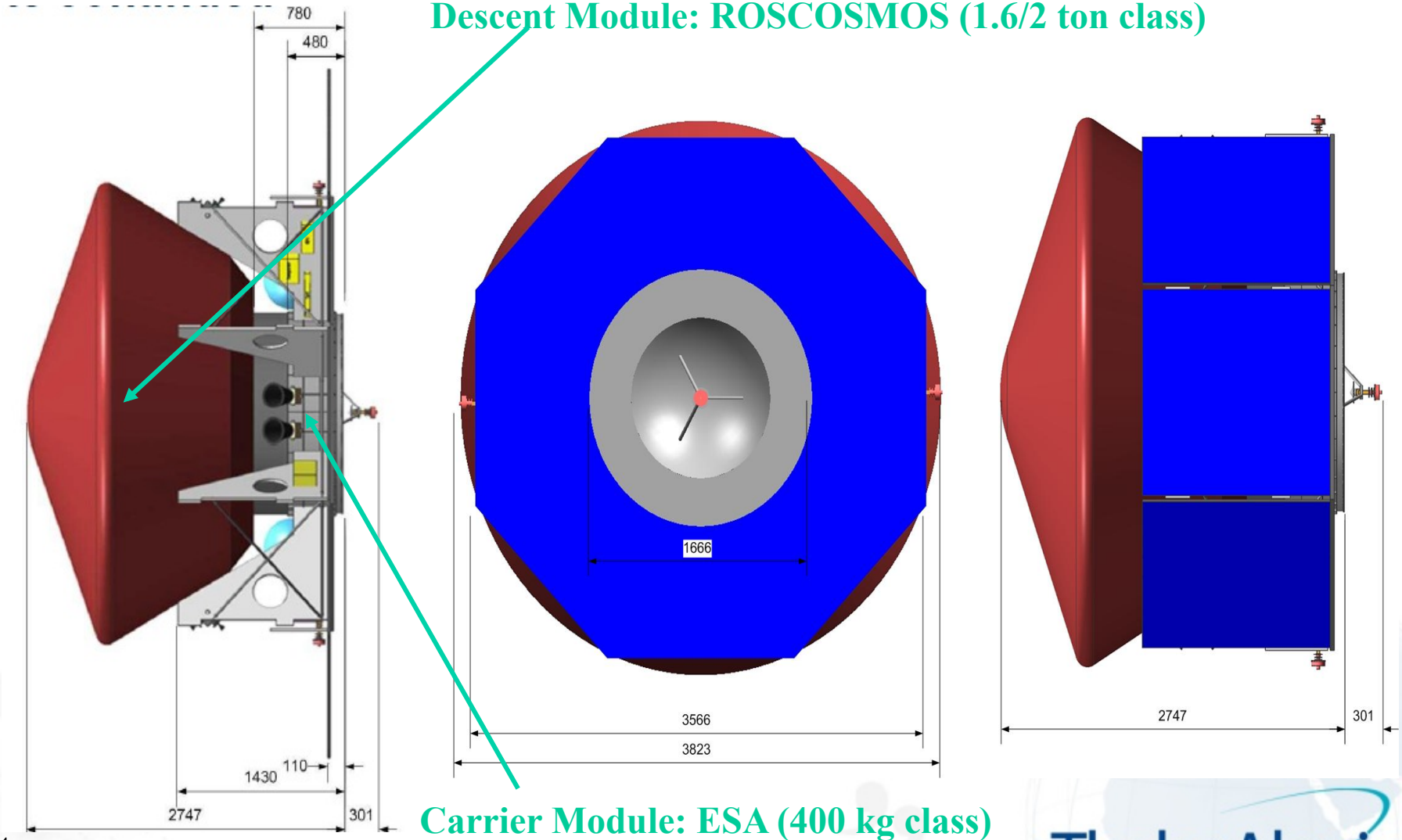
2018 mission - Spacecraft Composite

Descent Module: ROSCOSMOS (1.6/2 ton class)



Carrier Module: ESA (400 kg class)

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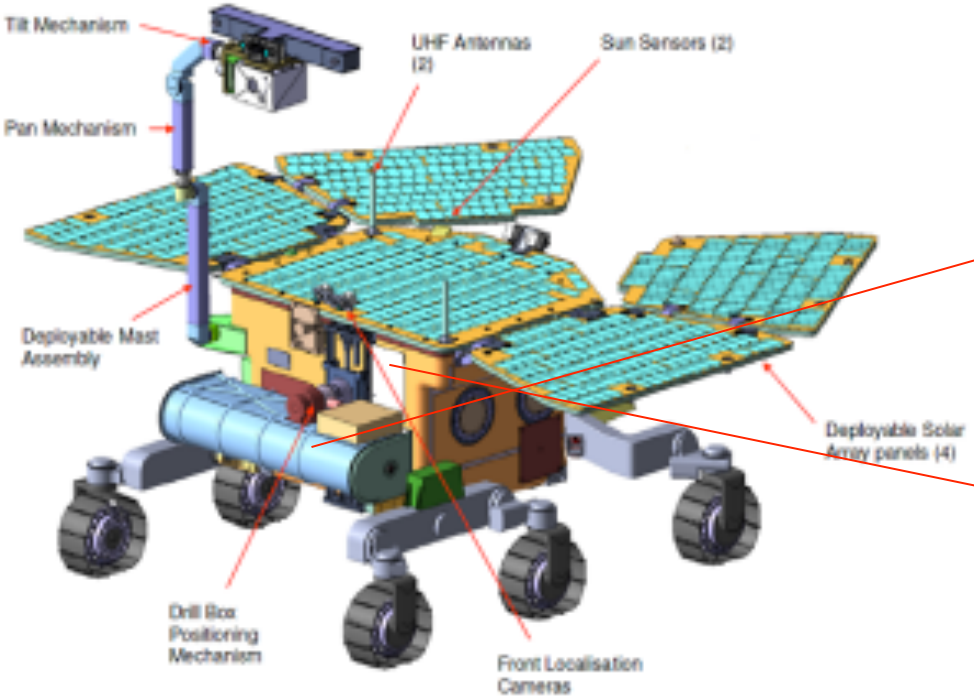
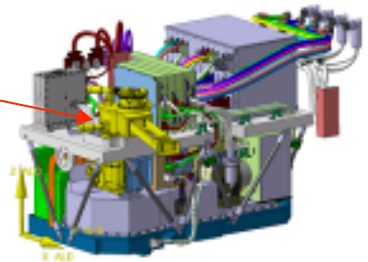
Rover: ESA (350 kg class)

Two Russian instruments (Infrared Spectrometer on Deployable Mast and Radiation Monitor on the RV body)



Drill



ALD

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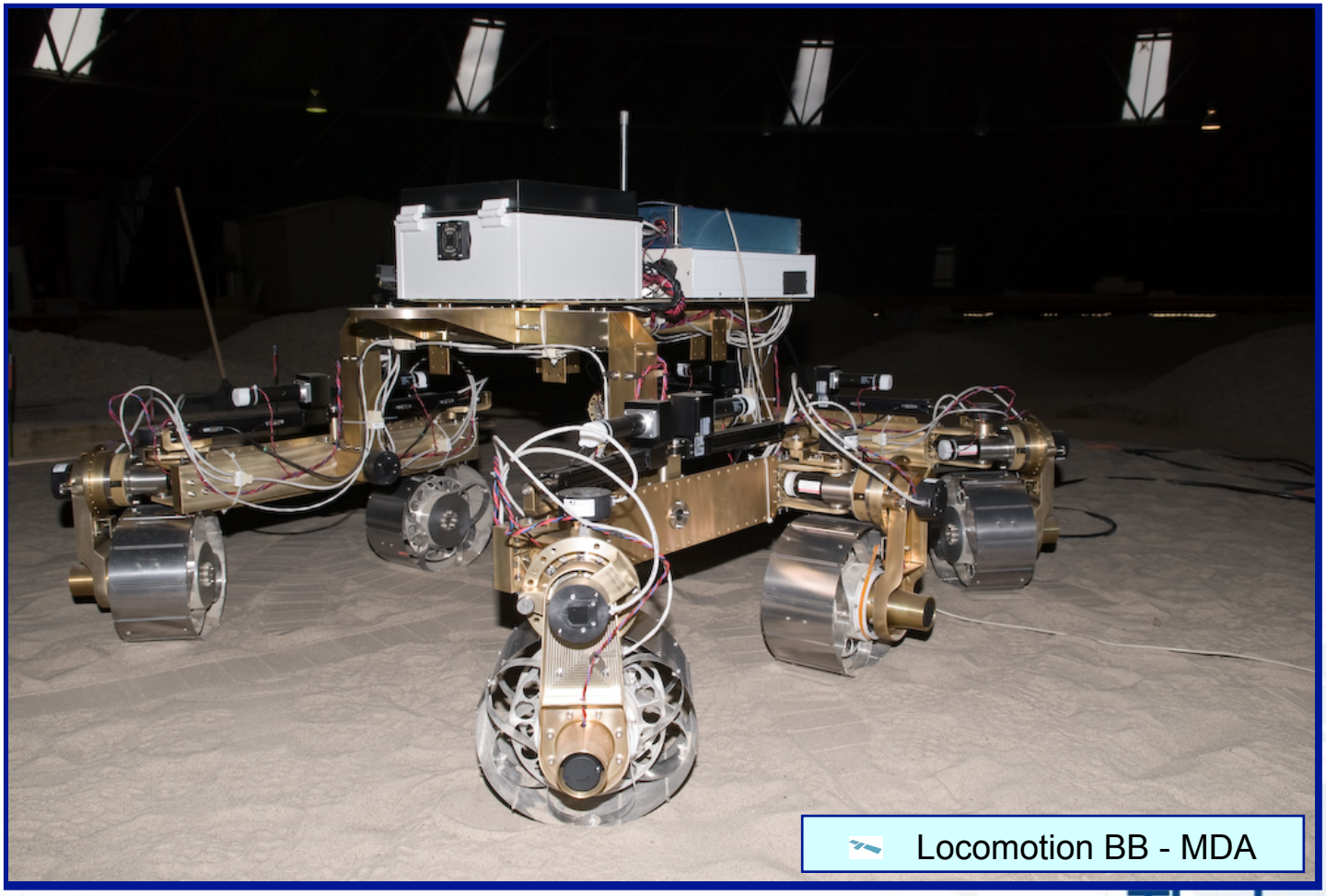
Technology Readiness



Locomotion BB - MDA

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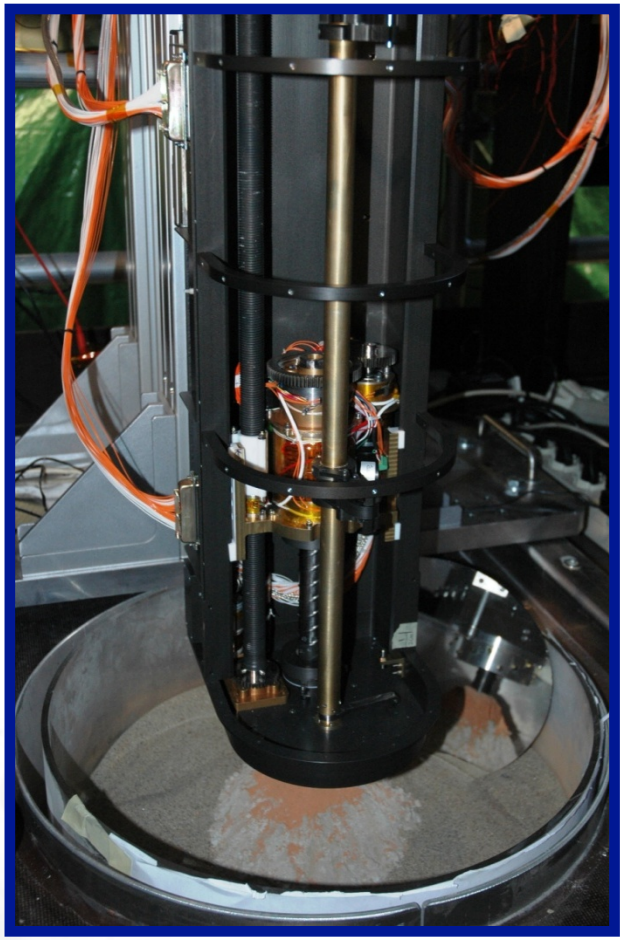
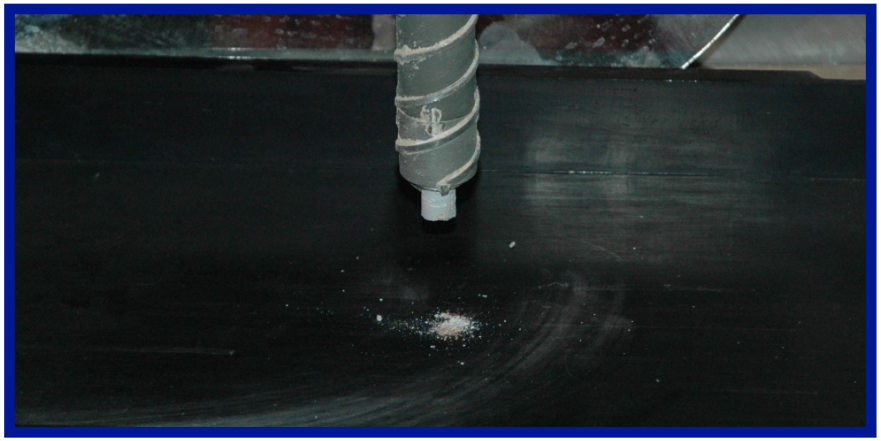
Technology Readiness

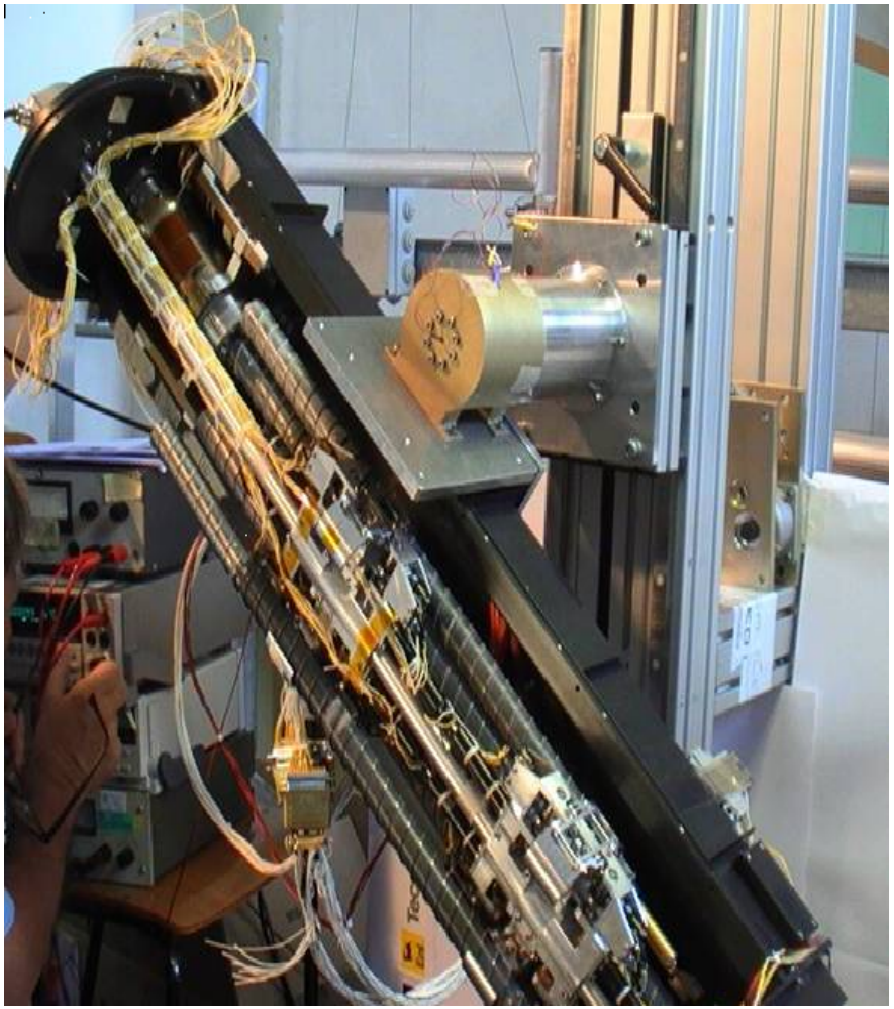




24 Apr 2012

Drill BB – Galileo Avionica

Technology Readiness



- Drill BB (courtesy of Selex)

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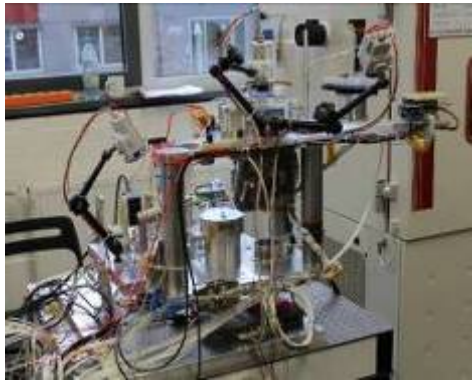
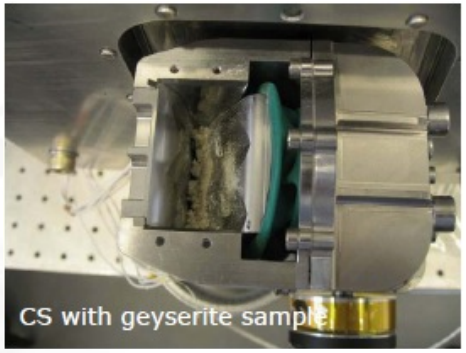
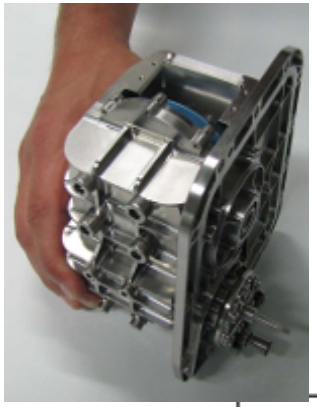
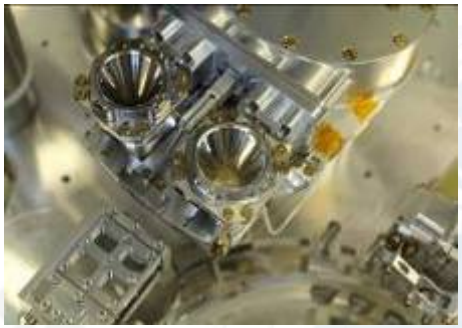
2018 Mission – SPDS Ongoing verification activities

- **The complete SPDS mechanism assembly has been assembled in order to perform functional and performance test of the mechanism chain in KT (D).**
- **E2E test campaign completed in both Laboratory and Mars-like conditions (temperature and pressure) with success.**









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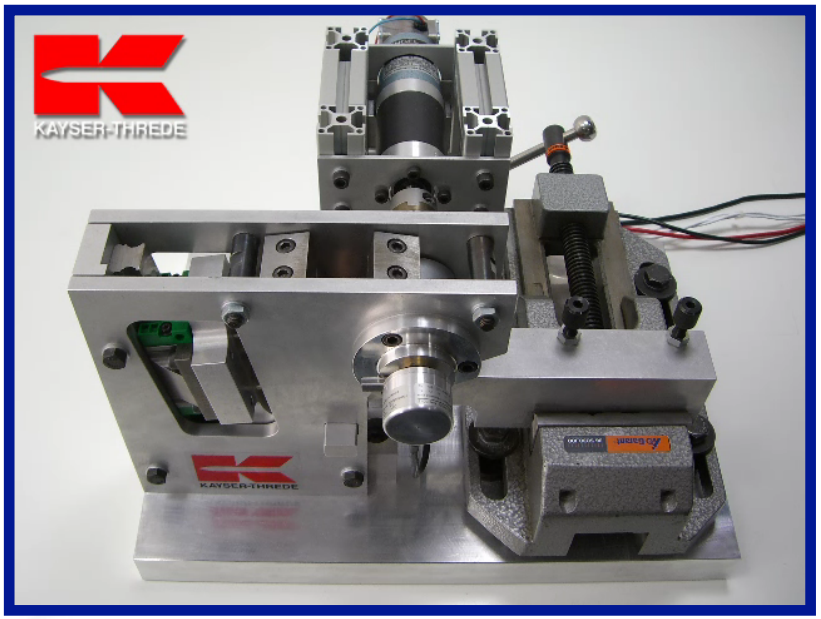
Technology Readiness



Milling Station BB – courtesy of Kaiser Threde

Dosing Station BB – courtesy of Kaiser Threde

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GRAZIE